FOREST PEST CONDITIONS IN CALIFORNIA-1979

A PUBLICATION OF
THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL was founded in 1951. Its membership is open to public and private forest managers, foresters, entomologists, pathologists, zoologists, and others interested in the protection of forests from damage caused by animals, insects, and diseases. Its objective is to establish, maintain, and improve communication among individuals-- managers, administrators, and researchers -- who are concerned with these problems. This objective is accomplished by four actions:

1. Coordination of detection reporting and compilation of pest damage information.

2. Evaluation of pest conditions.

3. Pest control recommendations made to forest managing agencies and owners.

4. Review of policy, legal, and research aspects of forest pest control, and submission of recommendations thereon to appropriate authorities.

The State Board of Forestry recognizes the Council as an advisory body in forest pest protection. The Council is a participating member in the Western Forest Pest Committee of the Western Forestry Conservation Association.

This report, FOREST PEST CONDITIONS IN CALIFORNIA - 1979, is complied for public and private forest land managers to keep them informed of pest conditions on forested land in California, and as an historical record of pest trends and occurrences. The report is based largely on information provided by the Statewide Cooperative Forest Pest Detection Survey; in 1979, 125 reports were received: 64 for insect pests, 26 for diseases and 35 for animal pests.

The report was prepared by the Forest Service in cooperation with other member organizations of the Council. It was duplicated and distributed by the California Department of Forestry.

THE COVER PHOTO: Phoradendron bolleanum subspecies pauciflorum, a leafy mistletoe of white fir (Abies concolor). The mistletoe is disseminated by members of the thrush family, including the western bluebird, the robin, and Townsend's solitaire. The mistletoe causes extensive branch dieback and heavily infected trees are preferentially attacked by the fir engraver beetle, Scolytus ventralis. Further information on this disease may be found in Know Your Forest Diseases on page 16.

Sacramento January 1980

COUNCIL AND COMMITTEE OFFICERS, 1979 - 1980

Council Chairman: Roy H. Richards (Paul Bunyan Lumber Company, Anderson)

Council Vice-Chairman: Donald L. Dahlsten (University of California, Berkeley)

Council Secretary: John M. Wenz (Forest Service, San Francisco)

Standing Committees:

Insect Committee:
Chairman: Bruce H. Roettgering (Forest Service, San Francisco)

Secretary: Bill Bedard (Pacific Southwest Forest and Range Experiment Station, Berkeley)

Disease Committee:
Chairman: John Pronos (Forest Service, San Francisco)

Secretary: Dave Adams (California Department of Forestry, Sacramento)

Animal Damage Committee:
Acting Chairman: Norm Holgersen (Fish and Wildlife Service, Sacramento)

Secretary: Norm Holgersen (Fish and Wildlife Service, Sacramento)

Southern California Committee:
Chairman: Loren Jones (Forest Service, Fontana)

Secretary: Jim Bridges (Forest Service, San Bernardino)

Editorial Committee:
Chairman: Richard Hunt (California Department of Forestry, Sacramento)

Executive Committee:

The Executive Committee is composed of the Council Officers (3) and the Standing Committee Officers (9), as well as the following members at large:

Bob Scharpf (Pacific Southwest Forest and Range Experiment Station, Berkeley)
Lorne West (National Park Service, Yosemite)
Ray Whiteley (Soper-Wheeler Company, Strawberry)

CONTENTS

HIGHLIGHTS OF PEST CONDITIONS - 1979	1
STATUS AND CONTROL OF INSECTS	3
STATUS AND CONTROL OF DISEASES	12
KNOW YOUR FOREST DISEASES: TRUE MISTLETOE ON WHITE FIR	16
STATUS AND CONTROL OF ANIMAL PESTS	18
SURVEYS AND EVALUATIONS	20

HIGHLIGHTS OF PEST CONDITIONS - 1979

STATUS OF INSECT PESTS. As the forests of northern California continued to recover from the severe drought of 1975-1977, the decline in tree mortality noted in the fall of 1978 continued through 1979. Most pronounced and obvious was the decline associated with the western pine beetle. From a high incidence of large groups of infested ponderosa pine in the spring of 1978, mortality dropped steadily and sharply during the summer of 1979 (Table 1). At year's end, only pre-drought numbers of scattered, infested trees could be found. Understandably, there were some localized areas within the State where trees infested with the western pine beetle were numerous. But, these situations were the exception rather than the rule.

TABLE I. Tree mortality on the 6.3 million acres of commercial forest land in the 12 National Forests of northern California, 1975 to 1979.

YEARS (June to June)	NO. OF TREES KILLED	S.B.F. VOLUME OF KILLED TREES
1975 to 1976	2.0 MM	1.9 MMM
1976 to 1977	4.5 MM	1.2 MMM
1977 to 1978	5.8 MM	5.5 MMM
1978 to 1979	1.1 MM	1.0 MMM

Scattered outbreaks of the Jeffrey pine beetle and mountain pine beetle occurred in the eastside pine type of northeastern California, and caused some concern to resource managers.

Top killing and tree mortality in red and white fir was scattered and widespread. Several diseases and insects were implicated, including the fir engraver and roundheaded and flatheaded borers, but by fall, populations of these insects seemed to be declining also.

Two defoliators caused serious feeding injury over large acreage of host type -- the pandora moth over some 10,000 acres of Jeffrey pine in Mono County, and the fruittree leafroller on an estimated 14,000 acres of mixed hardwoods in San Bernardino County.

A persistent, high level population of the black pine leaf scale on rust-resistant sugar pine was chemically treated at the Badger Hill Breeding Arboretum. The treatment failed to suppress the population to a satisfactory level.

STATUS OF DISEASES. Pest detection reports submitted during the spring indicated that winter injury was common in many areas, but not serious. Two diseases that are normally of minor or local importance were highly visible and widespread in California in 1979. The two

were Cytospora canker on true fir and Elytroderma needle disease on ponderosa and Jeffrey pines.

There were no dramatic changes in the severity or prevalence of root diseases and dwarf mistletoes; however, these two categories continue to be the major disease problems confronting land managers. Visible injury to pines from air pollution increased noticeably in several southern Sierra Nevada locations in 1979, even though measured levels of ozone were not above those recorded in 1978.

Fusarium oxysporum was the single most damaging fungus in both State and Federal tree nurseries. Various levels of damage were reported for sugar pine, Douglas-fir, ponderosa pine, Jeffrey pine, white fir and red fir.

STATUS OF ANIMAL PESTS. Pocket gopher, deer, and porcupine were again the three mammal species that caused the most significant damage to commercial conifer forests.

Figure 1. Pendant silken threads of the Fruittree Leafroller that often create a nuisance for homeowners and outdoor recreationists.

STATUS AND CONTROL OF INSECTS

DOUGLAS FIR TUSSOCK MOTH, Orgyia pseudotsugata. Douglas-fir tussock moth larval populations declined from 1978 population levels on monitoring plots in El Dorado County. Over 1000 early warning pheromone traps were deployed in Northern and central California in 1979 and overall, few adult males were caught, reflecting generally low populations levels. One exception was an area along Highway 20 in Nevada County east of Nevada City where larvae and pupae were easily found, trap catches were relatively high, and minor feeding damage to the current years growth was in evidence.

PANDORA MOTH, Coloradia pandora. An outbreak of pandora moth on Jeffrey pine was detected in Mono County in late May. The infestation straddled Highway 395 and encompassed Lookout Mountain and the Crestview Rest area. A central area of about 5000 acres was completely defoliated and nearby pockets of defoliation increased the gross area to about 10,000 acres. Larvae feeding was completed by mid-July and the trees appeared to be refoliating. Nuclear polyhedrosisvirus was confirmed from the larvae population. Little defoliation is expected in the area in 1980. The moth has a two year life cycle and larvae will be generally absent in 1980. The pandora moth was also reported on ponderosa pine in Calaveras County and on Jeffrey pine in Tuolumne County.

LODGEPOLE PINE NEEDLE MINER, Coleotechnites milleri. Populations continue to defoliate lodgepole pine on approximately 100,000 forested acres in the Merced and Tuolumne River drainages in Yosemite National Park. The infestation has spread somewhat to the east and southeast of the previously infested area and some tree mortality has again been reported from Lyell Canyon and north of Tuolumne Meadows.

GYPSY MOTH, Porthetria dispar. Four adult male gypsy moths were caught in pheromone detection traps in 1979. Two moths were trapped in Santa Barbara County and one each in Los Angeles County near El Monte and in Santa Clara County near Coyote.

SILVERSPOTTED TIGER MOTH, Halisidota argentata. No activity was reported from the severe 1977 infestation in Eden Valley-Elk Creek (Mendocino County). Light activity (numerous larvae, little damage) was reported from Siskiyou County.

TENT CATERPILLAR, Malacosoma sp. No caterpillar activity was reported from the bitterbrush infestation area in Inyo County active in the mid-1970's. Tent caterpillars on live oak were reported from San Diego County (Lyons Valley) and Mendocino County (Round Valley).

Figure 2. Pines killed by the western pine beetle, Lower River Campground, Yosemite National Park.

SAWFLIES, Neodiprion spp. Pine sawflies were reported on about 10 acres of ponderosa pine saplings in Shasta County and on sugar pine seedlings in a plantation in Colusa County. No reports of exceptional white fir sawfly activity were received in 1979.

FRUITTREE LEAFROLLER, Archips argyrospilus. The fruittree leafroller infestation (Figure 1) continued in 1979 in the Lake Gregory, Lake Arrowhead, Running Spring, and San Sevaine Ridge areas, San Bernardino County. Ornametal oaks and citrus trees were damaged near Lake Gregory, and California black oak was defoliated in the Lake Arrowhead and San Sevaine areas. In addition, a new infestation was reported southwest of the San Gorgonio Wilderness area, also in San Bernardino County. Defoliation levels ranged from light (Valley of Enchantment) to moderate (Running Springs) to heavy (Miller Canyon and Frog Point). In the area surveyed, the California oakworm, Phryganidia californica, and a tent caterpillar, Malacosoma sp., were found associated with the leafroller.

JEFFREY PINE NEEDLE MINER, Coleotechnites sp. nr. milleri. Population levels and feeding injury by the Jeffrey pine needle miner in the Green Valley, Big Bear City, Fawnskin and Lake Erwin areas in San Bernardino County continue to decline. No new areas of infestation have been reported.

WESTERN PINE BEETLE, Dendroctonus brevicomis. Ponderosa pine mortality due to the western pine beetle was lower than it was during 1978, but it was still above normal. In contrast to last year, pine mortality was concentrated at higher elevations and consequently much of it occured on National Forests. Mortality due to the western pine beetle was generally scattered throughout the Sierra Nevada with the exception of concentrations of mortality south of Stumpy Meadows Lake, El Dorado County; the State Game Refuge south of Lumberyard, Amador County; Calaveras Big Trees State Park and the adjacent communities of Arnold and Dorrington, Calaveras County; the State Game Refuge south of Dorrington and the Mather Family Camp at Groveland, Tuolumne County; and much of the Stanislaus and Sierra National Forests and Yosemite National Park (Figure 2) in Calaveras, Tuolumne, Mariposa, Madera, and Fresno Counties.

In situations where scattered and concentrated ponderosa pine mortality occured, overstocking, dwarf mistletoe and overmature trees were major factors predisposing the trees to attack by the western pine beetle.

Extensive ground checking in October 1979 found very few green ponderosa pine infested with western pine beetle and low numbers of dead trees still containing brood or callow adults. An exception was in Lassen County where considerable infestation remains around the Blacks Mountain - Patterson Mountain area. Trees that died during the late spring and summer of 1979 showed evidence of rather extensive woodpecker work.

PINE ENGRAVER BEETLES, Ips spp. Damage to pine by pine engravers was low during 1979, at about the same level experienced during 1978. Precipitation in the Sierra Nevada was about normal from October 1978 through April 1979, which may have contributed to the low levels of damage observed. Some killing of Coulter pine saplings occurred in southern California near Trabuco Peak in Riverside County. There was a buildup in logging slash on Bureau of Indian Affairs lands near the Agua Tibia Wilderness, San Diego County, and the area is being monitored closely.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. Mountain pine beetle activity in sugar pine throughout northern California continued at about the same high level seen last year. The only reported concentration of sugar pine mortality was about 100 trees near Countyline Road between Shasta and Trinity Counties. Commonly-seen factors which predisposed sugar pine to attack by the mountain pine beetle included overmature old growth trees, blister rust affecting young trees in drainages, and overstocking.

Ponderosa pine mortality caused by mountain pine beetle was locally important in northeastern California. Areas of concentrated mortality were generally overstocked pole stands although trees of all sizes were affected. Some of the larger mortality areas were Blue Mountain, Modoc County; north of Lake Britton, Soldier Mountain, Hat Creek Rim, Shasta County; Lake Davis, Plumas County. One area where large trees were being killed was in Lassen County, generally around Poison Lake.

Lodgepole pine mortality due to the mountain pine beetle was common at higher elevations in the Sierra Nevada during 1979. Lodgepole pine commonly occurs around meadows and wet areas and the mortality may be a delayed result of the recent drought. The only concentrations of lodgepole pine mortality reported were Buck Mountain, Lassen County; and north of Antelope Lake, Plumas County.

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. The Jeffrey pine beetle was quite active throughout the Sierra Nevada and in northeastern California. Mortality due to the Jeffrey pine beetle was noted at Upper Parker Creek, Modoc County; Lost Creek, Hat Creek Rim and Thousand Lakes Wilderness, Shasta County; Chaos Crags, Raker Peak and Butte Lake, Lassen Volcanic National Park; north of Antelope Lake and Squaw Valley Peak, Plumas County; Fallen Leaf Lake, El Dorado County; Granite Creek, Madera County; Portugese Pass, Tulare County. Green trees infested by the Jeffrey pine beetle during 1979 were detected in many of the mortality areas checked. Tree killing of epidemic dimension was evident in the Lost Creek area, Lassen Volcanic National Park.

FIR ENGRAVER, Scolytus ventralis. True fir mortality and top kills were scattered throughout the mixed conifer and red fir types in northern California. Group kills of 10 or more trees were relatively uncommon but the total number of trees affected statewide was quite

large. Much of the mortality in young and old growth red fir was attributed solely to the fir engraver. The butts of old growth red fir frequently were infested with only the roundheaded fir borer, Tetropium abietis, although in some cases the tops had been attacked by the fir engraver. In some of the fir mortality showing evidence of 1978 attacks by both the fir engraver and the roundheaded fir borer, the fir engraver attacks were commonly aborted or showed very low brood survival.

RED TURPENTINE BEETLE, Dendroctonus valens. In contrast to 1977 and 1978, the red turpentine beetle appears to have assumed a more typical role in the death and decline of pines this year. The red turpentine beetle was rarely found attacking pines in the absence of other beetles and attacks were usually confined to the root collar. The types of attacks seen, combined with a lower occurence of attack by the red turpentine beetle, may indicate a general increase in tree vigor following the drought. Exceptions to this condition were seen in Yosemite Valley, Yosemite National Park, and Bass Lake, Madera County, where vigorous turpentine beetle activity continued.

FLATHEADED AND ROUNDHEADED BORERS, Melanophila and Tetropium spp. The California flatheaded borer, Melanophila californica, was seen in ponderosa pine mixed with broods of the western pine beetle and mountain pine beetle in several chronic mortality areas in Shasta County. In contrast to last year, the California flatheaded borer was a relatively minor mortality agent of ponderosa and sugar pine in most of northern california. However, in southern California, at Laguna Mountain, San Diego County, this beetle was found in nearly all dying Jeffrey pine.

The fir flatheaded borer, M. drummondi, was uncommon in true fir, but was widespread in Douglas-fir in northwestern California. High levels of Douglas-fir mortality involving the fir flatheaded borer have been recognized since 1973 in Siskiyou, Trinity and Humboldt Counties. Other mortality agents, and site and stand conditions that predispose trees to mortality that have been identified in the area in past years include the Douglas-fir bark beetle, Polyporus schweinitzii root rot, a canker disease, dwarf mistletoe, hardwood competition, advanced tree age, and talus slopes.

The roundheaded fir borer, Tetropium abietis, was commonly found in dead red and white fir in 1979. In white fir the roundheaded borer was usually associated with either successful or aborted fir engraver attacks. In the lower boles of larger diameter red fir, the roundheaded fir borer was frequently the only insect infesting the tree.

CYPRESS BARK BEETLE, Phloeosinus cupressi. This insect was found on ornamental Monterey cypress in urban park settings, often in association with cypress canker and P. cristatus.

INSECTS IN TREE IMPROVEMENT AREAS. The black pineleaf scale, Nuculaspis californica, continued to occur in large numbers on the rust resistant sugar pine at the Badger Hill Tree Breeding Arboretum. Malathion 25 WP was applied during the crawler stage, but the scale population remains high.

Spider mites and grasshoppers continued to plague the efforts of tree breeders at the Chico Tree Improvement Center. An outbreak of mites during the hot weather of late summer was suppressed by treatment with Meta-Systox-R. When grasshoppers began to seriously damage grafted sugar and ponderosa pine, noncrop areas around transplant beds were treated with Sevin Bait (5% AI) and the transplant beds were treated with Sevimol 4 (40% AI). Grasshoppers are expected to remain a problem in 1980.

Progeny test plantations throughtout the state are now surveyed as often as possible to keep abreast of any insect and disease problems that may develope. These plantations remained free of all but scattered losses in 1979.

CONE AND SEED INSECTS Cone crops generally were poor throughout the state with the exception of sugar pine and Jeffrey pine. The sugar pine cone beetle, Conophthorus lambertiana, was common at scattered locations throughout the host range, but did not impede cone collection. A coneworm, Dioryctria sp., was infrequently found in sugar pine cones. Seedworms, Laspeyresia sp., were found in Jeffrey pine cones brought to the Placerville Nursery, but the loss per infested cone did not exceed seven seeds, which was a minor impact.

The fir coneworm, Dioryctria abietivorella, and the Douglas-fir cone midge, Contarinia orgonensis, continued to cause serious losses in Douglas-fir cones at the Badger Hill Tree Breeding Arboretum and the Chico Tree Improvement Center. The fir coneworm also attacked cones of Afganistan pine at the latter location.

TABLE II. INSECTS OF LIMITED IMPORTANCE IN CALIFORNIA FORESTS - 1979

PESTS Scientific Name	Common Name	HOSTS Names	WHERE EXAMINED OR REPORTED County	Remarks
Neophasia menapia	Pine butterfly	PP	Nevada	
Periploca nigra	a walshiid moth	JU	San Joaquin	Adults on cones
Dioryctria sp.		PP, KM	Calaveras	Seedlings
		DF, AP, PP	Butte	Tree Improvement Center
		SP	Placer	Plantation seedlings
Hyalophora sp.	a silk moth	DF	Placer	
Rhyacionia zozana	Ponderosa pine tip moth	PP	Butte	Tree Improvement Center
Malacosoma sp.	tent caterpillar	LO	San Diego, Mendocino	
	bagworm	WF	Modoc	
Nymphalis antiopa	Spiny-elm caterpillar	Elm	San Diego	
Scythropus sp.	Pine needle weevil	PP	El Dorado	Christmas Trees
		PP, JP	Modoc	Plantation
Pityogenes sp. Pityophthorus sp.	twig beetles	PP	Modoc	
Scolytus unispinosus	Douglas-fir engraver	DF	Trinity, Shasta	
Cynips douglasii	gall wasp	Oak	Fresno	
Acrididae	grasshoppers	PP, KM	Calaveras	
Aphrophora sp.	spittle bug	DF	Humboldt	Nursery

Hylemya platura	Seed corn maggot	JP	El Dorado	Nursery
Cinara sp.	Giant conifer aphids	SP, PP, WF	El Dorado, Trinity, Fresno, Shasta	Primarily nurseries and plantations
Lecanium corni	European fruit scale	CO	Siskiyou	Causing dieback and death
Matsucoccus sp.	scale	PP, JP SP	Modoc Calaveras	
Neodiprion fulviceps complex	Pine sawfly	PP	Shasta	
Chionaspis pinifoliae	Pine needle scale	PP, JP	Modoc	
-----	aphid	WF DF	Calaveras Sonoma	Saplings Christmas trees
Schizolachus pipiradiatae	Wooly pine needle aphid	PP, SP	Siskiyou	Plantations
Rhyacionia frustrana	Nantucket pine tip moth	MO	Orange San Diego	

HOST ABBREVIATIONS

AP = Afghanistan pine
CO = Chinquapin
DF = Douglas-fir
JP = Jeffrey pine
JU = Juniper
LO = Live oak
PP = Ponderosa pine
KM = Knobcone x Monterey pine
MO = Monterey pine
SP = Sugar pine
WF = White fir

TABLE III. INSECT CONTROL ACTIONS RECOMMENDED - 1979

INFESTATION AREA	ACREAGE (Est.)	COUNTY	INSECT	HOST	RECOMMENDED ACTION
NORTHERN CALIFORNIA COMMERCIAL AND RECREATIONAL FORESTS					
BARK BEETLES					
Northern California	--	--	Db, Dj, Dp, Dps, Ips, Mc, Md, Sv	CF	Stand Management, Slash Disposal
DEFOLIATORS					
Statewide	--	--	Gm	OA	Surveillance
Statewide	--	--	Op	WF	Surveillance
Lookout Mtn.	10,000	Mono	Cp	JP	Surveillance, Evaluate
PLANTATIONS AND SEED ORCHARDS					
Seed Orchards	100	Northern California	Da	PP, DF, SP	Surveillance, Treat new grafts with Lindane
Plantations	--	Statewide	Eu, Zh, Cp, Rz	CF	Surveillance, Evaluate
STATE AND NATIONAL PARKS					
State and National Parks	--	--	Dj, Db, Dp	JP, PP, SP, LP	Stand management, Prescribe burn, Borax stump treatment
Yosemite National Park	100,000	Tuolumne	Cm	LP	Surveillance

SOUTHERN CALIFORNIA RECREATIONAL FORESTS

Southern California	--	San Bernardino	Dp, Db, Ips, Dj	PP, CP, JP, SP	Stand Management, Borax stump treatment
		Los Angeles, Riverside, Ventura, Santa Barbara	Mc, Dv, Sv	PP, CP, JP, SP, WF	Stand Management, Borax stump treatment
Lake Gregory, Lake Arrowhead, San Gorgonio	14,000	San Bernardino	Aa	OA	Surveillance, Evaluate

PEST ABBREVIATIONS

Aa = Fruittree leafroller
Cj = Jeffrey pine needle miner
Cm = Lodgepole needleminer
Cp = Pandora moth
Cpp = Pine resin midge
Da = Fir coneworm
Db = Western pine beetle
Dj = Jeffrey pine beetle
Dp = Mountain pine beetle
Dps = Douglas-fir beetle
Dv = Red turpentine beetle
Eu = Eucosma
Gm = Gypsy moth
Ips = Pine ips
Mc = California flatheaded borer
Md = Flatheaded fir borer
Op = Douglas-fir tussock moth
Rz = Ponderosa pine tip moth
Sv = Fir engraver
Zh = Needle sheath miner

HOST ABBREVIATIONS

CF = Conifers
CP = Coulter pine
DF = Douglas-fir
JP = Jeffrey pine
LP = Lodgepole pine
MP = Monterey pine
OA = Oak
PP = Ponderosa pine
SP = Sugar pine
WF = White fir

STATUS AND CONTROL OF DISEASES

ABIOTIC. The majority of pest detection reports received during the spring months involved some form of abiotic injury. Most prevalent was winter damage due to either low temperature or desiccation. These reports came from San Bernardino County north to Amador County, and included a report from Mono County. None of the injury was serious or permanent.

ROOT DISEASES. Fomes annosus was again the most serious and common root pathogen affecting all conifer species on land managed for recreation (Figure 3) or for timber production. More than a third of the requests for pest evaluations on National Forest land throughout California involved tree mortality caused by F. annosus. Increased awareness and recognition of root disease centers by foresters and silviculturists accounted for numerous reports of problems and requests for control options.

WHITE PINE BLISTER RUST, Cronartium ribicola. The spring examination at the rust-resistant sugar pine test site near Happy Camp (Siskiyou County) confirmed that a substantial proportion of the previously resistant pines had become infected for the first time. These infections suggest that a new or previously unknown race of the rust may have overcome the single-gene dominant resistance of the host. Much of the rust at the test site originated in 1976; it remains to be seen whether subsequent years' infections will be more or less damaging to the pines.

AIR POLLUTION. The Forest Service monitored ozone concentrations from June through October at three sites in Tulare County -- Whitaker Forest, Lodgepole, and Mountain Home State Forest -- and at one site in Kern County -- Greenhorn Summit. Federal and State standards were exceeded at all locations during the summer, and daily maxima were often in the range of 10 to 14 parts per hundred million ozone, sufficient to cause observed symptoms on ponderosa and Jeffrey pines.

Twenty-seven air pollution trend plots scattered throughout the southern Sierra were evaluated for ozone injury in 1979 and compared to the level of injury found in the same plots in 1977. Nineteen of these plots showed increased levels of ozone injury, six showed no change and two had less injury. Very dramatic increases in injury at certain sites seemed partly due to abnormally poor needle retention. Many pines showing symptoms retained only two years of needles and had lost all foliage produced during the drought years of 1976 and 1977. Future recovery from drought stress in the form of increased needle retention may show a relative reduction in the amount of air pollution injury to pines in the next few years.

Figure 3. An infection center of Fomes annosus in which the ponderosa pine have been killed by the western pine beetle, near Ahwahnee Lodge, Yosemite National Park.

CYTOSPORA CANKER, Cytospora abietis. There were unusually high occurrences of branch flagging on red and white fir in much of northern California during 1979. The flagging was caused by Cytospora abietis, a canker-inducing fungus that typically intensifies within the State following periods of drought. This cankering complicated the recognition and salvage marking of high-risk firs already impacted by moisture stress, the fir engraver (Scolytus ventralis), dwarf mistletoe, and true mistletoe.

ELYTRODERMA NEEDLE DISEASE, Elytroderma deformans. The incidence of this needle cast was higher than normal in localized areas scattered throughout most of the range of ponderosa and Jeffrey pine. Favorable environmental conditions in the fall of 1978 , especially available moisture, probably accounted for the increased infection. Although the disease was highly visible, it did not cause unusually serious damage.

DUTCH ELM DISEASE, Ceratocystis ulmi. The California Department of Food and Agriculture completed another year of surveys and aggressive sanitation to control Dutch elm disease. The disease was reported for the first time in Alameda County, bringing the total number of affected counties in the San Francisco Bay Area to eight. In 1979, 172 diseased trees were removed from these eight counties. The annual loss of elms within disease "sites" (1000 foot radius around a diseased tree) is about one percent or less, and many of these "sites" have been free of disease for three years or more.

NURSERY DISEASES. Fusarium oxysporum was the most serious disease in the Federal and State bareroot nurseries in 1979. At the Placerville Nursery, where preventative treatments were the same for both years, sugar pine mortality was 12% in 1979 compared to 7% in 1978. Mortality increased in Douglas-fir as well -- 2.8% in 1979 compared to 0.8% in 1978. Ponderosa and Jeffrey pine losses decreased in 1979.

At Magalia, F. oxysporum killed 50% of the 1-0 sugar pine, 50% of the 1-0 white fir, and 35% of the 1-0 red fir. Pythium spp. killed some 3% of the ponderosa and Jeffrey pine.

F. oxysporum-caused mortality was insignificant at Ben Lomond and Humboldt Nurseries. At Ben Lomond F. oxysporum killed 1% of the Douglas-fir and Scotch pine, and 1-2% of the 1-0 white fir. At Humboldt F. oxysporum killed scattered individual seedlings or small clusters of 5-15 trees, but the losses were minimal.

Phomopsis lokoyae caused some scattered losses of 2-0 Douglas-fir at Humboldt Nursery.

At the Chico Tree Improvement Center, water molds killed 20% of the ponderosa pine and 50% of the sugar pine potted stock.

TABLE IV. FOREST DISEASES REPORTED - 1979

AGENT	HOST	COUNTY
ABIOTIC DISEASES		
Chemical	RW	Sonoma
Weather	IC	Tuolumne
	CI	Tulare
	PP, SP	San Bernardino
	PP, JP	Fresno
	SP	Amador
	RF	Mono
Unknown	PP, JP	Plumas
	AP	Butte
FOLIAGE DISEASES		
Elytroderma deformans	JP	Shasta/Lassen
Herpotrichia nigra	IC	Shasta/Lassen
Lirula abietis-concoloris	WF	Shasta/Lassen
Lophodermium nitens	SP	Shasta/Lassen
Virgella robusta (*Hypoderma robustum*)	WF	Shasta/Lassen
HEART ROTS		
Echinodontium tinctorum	RF	Shasta/Lassen
Fomes pini	DF	Yuba
Polyporus amarus	IC	Tuolumne
NURSERY DISEASES		
Fertilizer burn	PP	Butte
Phomopsis lokoyae	DF	Humboldt
Phytophthora sp.	DF	Butte
Pythium sp.	DF	Butte
PARASITIC SEED PLANTS		
Dodder	BC	Calaveras
Mistletoes		
Arceuthobium spp.	JP	Shasta/Lassen
	PP	Tuolumne
	WF	Shasta/Lassen
	LP	Shasta/Lassen
Phoradendron spp.	JU	Shasta/Lassen
	IC	Shasta/Lassen

ROOT ROTS

Armillaria mellea	DF	Placer
	WF	Shasta/Lassen
Fomes annosus	PP	Fresno
Polyporus schweinitzii	JP	Shasta/Lassen

RUSTS

Cronartium ribicola	SP	Sierra
	SP	Calaveras
Gymnosporangium libocedri	IC	Tuolumne (2)
	IC	Shasta/Lassen
Melampsorella caryophyllacearum	WF	Fresno
Peridermium harknessii	LP	Shasta/Lassen
Peridermium stalactiforme	LP	Siskiyou

HOST ABBREVIATIONS

AP = Aleppo pine	LP = Lodgepole pine
BC = Bear clover	PP = Ponderosa pine
CI = Canary Island pine	RW = Redwood
DF = Douglas-fir	RF = Red fir
IC = Incense-cedar	SP = Sugar pine
JP = Jeffrey pine	WF = White fir
JU = Juniper	

KNOW YOUR FOREST DISEASES: TRUE MISTLETOE ON WHITE FIR

When one thinks of mistletoe on white fir, the image of the widespread and damaging dwarf mistletoe, (Arceuthobium abietinum f. sp. concoloris) usually comes to mind. Less commonly known as a parasite of white fir is the dwarf mistletoe's close relative, the leafy mistletoe, Phoradendron bolleanum ssp. pauciflorum. One reason why this mistletoe is less widely known than its diminutive relative is that it has a more limited range on its host species. If you travel north of the Eldorado National Forest in the Sierra Nevada you will not encounter this parasitic plant. As you travel southwest in the Sierra Nevada into the mountains of southern California this mistletoe becomes increasingly abundant and conspicuous. It has even managed to inhabit outlying and isolated stands of white fir in the Santa Catalina Mountains of Arizona and the San Pedro Mountains in Baja California, Mexico. The current explanation for the absence of this mistletoe in the northern range of the host is that it is killed by extreme cold. Thus, it is better adapted to survival and growth on white fir throughout the southern part of its range.

The leafy mistletoe on white fir is unique in that it is the only true mistletoe in the United States that occurs on a species in the family Pinaceae. And, only white fir, Abies concolor, is infected. Thus, white fir has the dubious distinction of being the only conifer species in the United States to support both a dwarf mistletoe and a true mistletoe. Other species and subspecies of true mistletoes occur on various hardwoods and on conifers in the Cupressaceae family, however.

BIOLOGY. Like all mistletoes, true mistletoe of white fir is a seed-producing plant that contains chlorophyll, but requires a living host on which to grow and survive. Unlike dwarf mistletoes, which mechanically disperse their seeds by an "explosive discharge" mechanism, the true mistletoes rely on birds for dispersal. Robins, western bluebirds, and Townsend's solitaires are the bird species most commonly observed feeding on and dispersing seeds of white fir mistletoe. Cedar waxwings and Stellar jays are believed to feed on and disperse white fir mistletoe seeds as well.

The seeds of mistletoe can be transported from one tree to another on the feet and beaks of birds or may be excreted intact from the birds' alimentary system. A sticky, thread-like outer coating enables them to stick to branches where they germinate and infect the host. Because of the perching habit of the birds, most initial infections occur in the tops of the larger trees in a stand. Smaller understory trees and young trees are usually not infected by this parasite. Once established, the mistletoe plants attract additional birds which spread the parasite to other trees and intensify the amount of mistletoe in the initially infected trees.

Over time, the older mistletoe plants appear as large clusters of dark green foliage in the upper portions of the tallest fir trees in the stand. Nearly all mistletoe plants develop on the trunk or on branches near the trunk rather than out near the tips of branches. As a result, the large clusters that develop are usually most obvious along the tree's main trunk or at the base of large branches. Because of the prolific development of the fir mistletoe in tops, trees often suffer moisture stress, and this stress frequently makes them subject to damage and death from attack by fir engraver beetles. Spike tops are often common in old growth white fir stands infected by this parasite. In some stands, serious volume losses can be attributed to this mistletoe and associated fir engraver attacks.

CONTROL. Control of this parasite is not practical in most forest stands. Harvesting of the heavily infected, merchantable trees in a stand will reduce population levels of mistletoe markedly, but the effect of this reduction on protecting residual trees from infection and damage is not known.

Mechanical removal of the aerial shoots and foliage of the mistletoe in the tops of infected trees does not kill the mistletoe root system and the parasite will eventually grow back. And to date, no successful chemical control of this parasite has been developed. Therefore, eradication of the parasite from infected trees is a virtual impossibility. In high value trees, however, pruning out mistletoe periodically can reduce moisture stress and lower the probability of damage from attack by fir engraver beetles.

It is not known how abundant this parasite will be in second-growth stands or how much damage it will cause under short rotations. It is expected that relatively little damage will occur because many years are required for this mistletoe to spread and build up to damaging proportions. Therefore, true mistletoe in fir may not constitute an important management problem in short rotation forests of the future.

STATUS AND CONTROL OF ANIMAL PESTS

POCKET GOPHER. Pocket gopher damage was a major problem in plantations of pines, true firs, and Douglas-fir in most timber areas. Increased damage occurred in the central and southern Sierra Nevada and in southern California. Baiting with strychnine-treated oats was the major control measure.

PORCUPINE. Porcupine damage to pines -- seedlings to sawtimber size -- was scattered through the northern inland forests and in the Sierra Nevada south to Madera County. Damage was most prevalent in the four northeastern Counties. Local increases and decreases in damage occurred in Trinity County and throughout the Sierra Nevada. Limited control with strychnine salt blocks and shooting was employed, principally in Shasta and Lassen Counties and in the central Sierra Nevada.

DEER. Deer browsing damage to plantations and natural regeneration of most commercial coniferous species occurred throughout the State. It was described by observers in northern forests as "widespread," "extensive," and "critical." Increased damage was noted in the northern coast range, the central Sierra Nevada, and in Butte and San Diego Counties. There was a continued increase in the use of Vexar tubes for control and limited application of repellents.

OTHER ANIMALS. The animals listed in Table V caused damage in the Counties or regions noted. Damage was severe in some areas, but it was generally not widespread.

TABLE V. REPORTS OF ANIMAL DAMAGE - 1979

SPECIES	COUNTY OR REGION
Beaver	San Diego
Birds	Butte
Black Bear	Humboldt
Dusky-footed Woodrat	Humboldt, Mendocino, Fresno, Madera
Elk	Siskiyou
Mountain Beaver	Humboldt, Trinity
Rabbits	Mendocino, Modoc, Lassen, Tehama, Plumas, Butte, Sierra, Yuba, Placer, El Dorado, Kern, San Diego, Central Coast Range
Small Seed-eating Mammals	Colusa, Glenn
Domestic Stock	Mendocino, Trinity, Siskiyou, Modoc, Lassen, Glenn, Colusa, Plumas, El Dorado, Tuolumne, Madera, Fresno, Tulare, Kern, San Diego
Tree Squirrels	Mendocino, Colusa, Glenn, Butte, Lake, Shasta, Lassen, Modoc, Plumas, Siskiyou, Nevada, Yuba, San Bernardino, Riverside
California Ground Squirrel	Butte, San Diego

SURVEYS AND EVALUATIONS

SAN BERNARDINO MOUNTAINS. A survey to determine the level and causes of tree mortality over a three-year period on the San Bernardino National Forest was completed. The average annual mortality for the mixed conifer, pine, and Coulter pine types combined was 7119 ± 438 trees and 3,767,961 ± 409,997 board feet. The mean annual number of trees killed per acre was 0.066 ± 0.007. Jeffrey pine, white fir and Coulter pine were the major species killed.

Insect/disease complexes were diagnosed as the cause of about three-fourths of the total tree mortality and nearly two-thirds of the mean annual volume loss. The fir engraver beetle (Scolytus ventralis), the roundheaded fir borer (Tetropium abietis), or both infested nearly all killed white fir. Two root pathogens, Fomes annosus and Armillaria mellea, and true mistletoe (Phoradendron bolleanum) were associated with a large proportion of fir mortality. Jeffrey pine mortality was associated with the Jeffrey pine beetle (Dendroctonus jeffreyi), California flatheaded borer (Melanophila californica), Ips spp., red turpentine beetle (Dendroctonus valens), two root pathogens (F. annosus and A. mellea), dwarf mistletoe (Arceuthobium campylopodum), and Elytroderma needlecast (Elytroderma deformans). About two-thirds of the Coulter pines apparently died from insects alone, mainly the western pine beetle (Dendroctonus brevicomis).

Options available for reducing and/or preventing pest damage in given situations include 1) borax treatment of freshly cut conifer stumps to prevent new F. annosus infections, 2) thinning to prevent bark beetle mortality and to minimize the effects of dwarf mistletoe, 3) sanitation for reducing levels of dwarf mistletoe, true mistletoe and Elytroderma needle disease, 4) species conversion in F. annosus root rot centers, and 5) overstory removal of dwarf mistletoe-infected trees.

STATEWIDE EVALUATION OF FOMES ANNOSUS IN TRUE FIR. The second year of work on a 5-year cooperative agreement (University of California, Berkeley and U.S. Forest Service) involving annosus root disease in true firs was completed in 1979. The objectives of the project are to:

1. Measure the amount of fir mortality associated with annosus root disease.

2. Measure the incidence and severity of root disease in living fir.

3. Measure the amount of fir windthrow associated with F. annosus.

4. Measure the annosus-caused root damage to true firs in selected recreation sites.

URBAN FORESTRY. The California Department of Forestry conducted a project involving the identification of insects and diseases on urban trees in locations such as Golden Gate Park and Alamo Square in San Francisco (San Francisco County). One of the more common problems found was cypress canker caused by Coryneum (Seridium) cardinale, which was especially damaging to most Monterey cypress planted outside of its natural range.

BIOLOGICAL EVALUATIONS. The following evaluations (Table VI) were conducted in California during 1979 by the Forest Service, Forest Insect and Disease Management (FIDM) Staff. These evaluations include brief descriptions of specific pest problems that were important on forest land. They also present current management alternatives, or control options, available to the land managers. Copies are available upon request from the Forest Service, FIDM, 630 Sansome Street, San Francisco, California 94111.

TABLE VI. BIOLOGICAL EVALUATIONS - 1979

EVALUATION NUMBER	EVALUATION LOCATION	ACRES EVALUATED	HOST SPECIES	PEST OR PESTS INVOLVED
79-01	Eagle Lake R.D., Lassen N.F.	5,000	WF	SV
79-02	Burgess and Harvey Timber Sales, Lassen N.F.	9,705	JP, PP	Fa
79-03	Low Mountain area,	1,000	DF, PP, SP	Md, Su, Ips, Dm, Db, Dv, Vw, Am, Ar
79-04	Mono Lake R.D., Inyo N.F.	38,000	AB	Mc
79-05	Big Bear North Shore Recreation Area, San Bernardino N.F.	420	JP	Dm
79-06	Indian Ridge area, Cleveland N.F.	480	CP	Ips, Ph
79-07	Ice Cave Timber Sale, Lassen, N.F.	6,900	JP, PP	Fa
79-08	Placerville Nursery	60	All conifer species	Persistent diseases
79-09	Badger Hill Breeding Arboretum	2	DF	Co
79-10	Badger Hill Breeding Arboretum	11	SP, PP, JP	Nc
79-11	Placerville Nursery	60	All conifer species	Damping-off fungi
79-12	Little Horse Peak Timber Sale, Klamath N.F.	30	WF	Sv
79-13	Tannery Gulch Recreation Area, Shasta-Trinity N.F.	20	DF	Tree hazard evaluation
79-14	Big Canyon and West Break Sale Areas, Shasta-Trinity N.F.	400	SP, WF	Dm, Sv, Md

79-15	Salvage sale, Plumas N.F.	100	WF, RF	Sv
79-16	LaPorte District, Plumas N.F.	100,000	WF, RF	Db, Dv
79-17	Polk Springs area, Lassen N.F. (Tree mortality update)	9,200	PP, SP, DF	Major insect and diseases
79-18	Timber Sale Area, Modoc N.F.	31	PP	Dm, Db, Ips, Fa
79-19	LaPorte District, Plumas N.F.	33,150	All conifer species	Dm, Dv, Ips, Db, Md, Br
79-20	Abbott Timber Sale Area, Sequoia N.F., Hume Lake R.D.	1,200	PP, SP, WF	Dm, Db, Ips, Sv, Ar, Fa
79-21	Sweet Pea Sale, Sierra N.F.	200	WF, SP, PP	Sv, Dm, Db, Fa, Am, Ar
79-22	Tree Improvement Program progeny test outplanting sites, Stanislaus N.F.	20	PP, WF	Ips, Ed, Ar
79-23	Proposed Laguna Mountain Entrance Site, Cleveland N.F.	20	JP, CP, BO, LO, IC, PN	Mc, Fa, Am, Ar, Ed
79-24	Mt. Tom Plantation Pineridge R.D., Sierra N.f.	312	JP, SP, WF, RF	Sv, Fa, Ar, Ed, Am
79-25	Indian Ridge Area, Cleveland N.F.	240	CP	Ph
79-26	Strawberry Mine salvage sale area, Sierra N.F.	50	RF	Sv, Ta, Pspp, Ar, Fa, Ca
79-27	Mammoth and Mono Lake R.D., Inyo N.F.	5,000+	JP, RF, WP	Cp, Pspp, Ips, Fa, Ph

HOST ABBREVIATONS	PEST ABBREVIATIONS
AB = Antelope bitterbrush	Am = Armillaria root rot
BO = Black Oak	Ar = Dwarf mistletoe
CP = Coulter pine	Br = Blister rust
DF = Douglas-fir	Ca = Cytospora canker
DP = Digger pine	Co = Douglas-fir cone midge
IC = Incense-cedar	Cp = Pandora moth
JP = Jeffrey pine	Db = Western pine beetle
LO = Live oak	Dm = Mountain pine beetle
PN = Pinyon pine	Dv = Red turpentine beetle
PP = Ponderosa pine	Ed = Elytroderma disease
RF = Red fir	Fa = Annosus root rot
SP = Sugar pine	Ips = Pine engravers
WF = White fir	Mc = California flatheaded borer
WP = Western white pine	Mcf = Tent caterpillar
	Md = Fir flatheaded borer
	Nc = Black pineleaf scale
	Ph = Western gall rust
	Pspp = twig beetles
	Su = Douglas-fir engraver
	Sv = Fir engraver
	Ta = Fir roundheaded borer
	Vw = Black stain root disease

FOREST PEST DETECTION REPORT. This Conditions Report is compiled from information recorded on this form by Federal, State, and private forest managers and individuals. The accuracy and completeness of the data reported here depends on the care with which people concerned with forests report incidents of damage caused by insects, diseases, animals, weather, chemicals, and air pollution. The form is available at local offices of the Forest Service, or from the California Department of Forestry.

FOREST PEST DETECTION REPORT

I. FIELD INFORMATION

A
- 1. County:
- 2. Forest (FS only):
- 3. District (FS only):
- 4. T._____ R. _____ S. _____
- 5. Date:
- 6. Location:
- 7. Land Ownership: 1 ☐ Forest Service 2 ☐ Other Federal 3 ☐ State 4 ☐ Private

B
- 8. Cause of Damage: 1 ☐ Insect 2 ☐ Disease 3 ☐ Animal 4 ☐ Weather 5 ☐ Other 6 ☐ Unknown
- 9. Size of Tree Damaged: 1 ☐ Seedling 2 ☐ Sapling 3 ☐ Pole 4 ☐ Sawtimber 5 ☐ Overmature
- 10. Part of Tree Damaged: 1 ☐ Root 2 ☐ Branch 3 ☐ Leader 4 ☐ Trunk 5 ☐ Twig 6 ☐ Bark 7 ☐ Cone 8 ☐ Foliage
- 11. Species Damaged:
- 12. Number Damaged:
- 13. Acres of Damage:

C
- 14. Damage Distribution: 1 ☐ Scattered 2 ☐ Grouped
- 15. Status of Damage: 1 ☐ Increasing 2 ☐ Decreasing 3 ☐ Static
- 16. Stand Type Class:
- 17. Plantation? 1 ☐ Yes 2 ☐ No
- 18. Estimated Stems/Acre:

D
- 19. Pest Name (if known), and Remarks (symptoms and contributing factors):

E
- 20. Sample Forwarded? 1 ☐ Yes 2 ☐ No
- 21. Action Requested: 1 ☐ Your Information 2 ☐ Lab Identification 3 ☐ Field Evaluation
- 22. Reporter's Name:
- 23. Reporter's Agency:
- 24. Reporter's Address:

II. REPLY

F
- 25

G
- 26. Report Number:
- 27.
- Date:_____ Signature:_____

Proposed Form R5-5200-33 (Rev. 7/75)

Title: Training session in "Forest Insect and Disease Identification and Management" given by FIDM, U.S. Forest Service.